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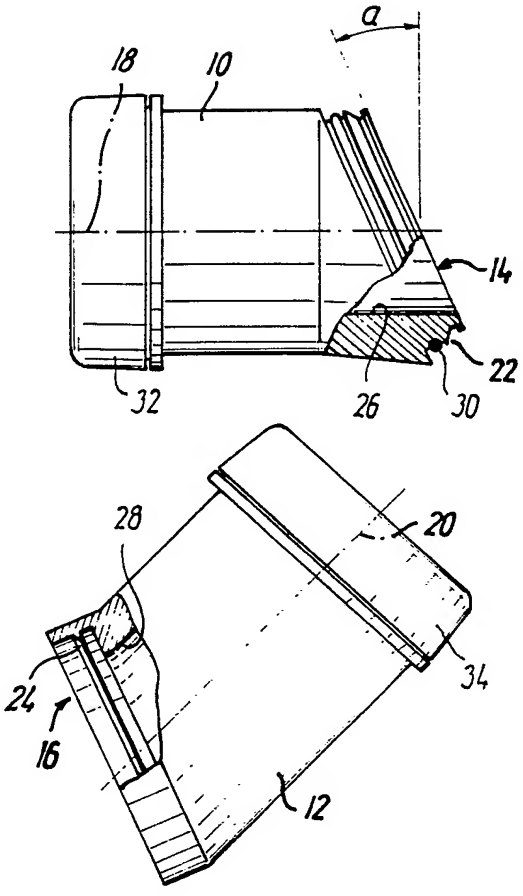
With international search report.
With amended claims.

(54) Title: AN ADJUSTABLE PIPE BEND FOR DRAIN PIPES

(57) Abstract

An adjustable pipe bend comprises two pipe bend parts (10, 12) having abutting end portions (14, 16) extending in a plane which is inclined, an angle α of 22.5° relative to a plane perpendicular to the main axis (18, 20) of the respective pipe bend part (10, 12). The pipe bend parts (10, 12) are rotatably connected to each other at said end portions (14, 16) for rotation about an axis perpendicular to said inclined plane by means of snap-lock connecting elements (22, 24) placed outside the light borings (26, 28) of said pipe bend parts (10, 12). Each connecting element is shaped as a body of rotation about said axis of rotation, and the snap-lock connection includes an O-ring seal (30). The pipe bend may optionally be set to any bending angle between 0° and 45° by turning the two pipe bend parts (10, 12) relative to each other, and in any position of the two pipe bend parts (10, 12), their main axis (18, 20) will either intersect each other or be substantially coincident.



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AN ADJUSTABLE PIPE BEND FOR DRAIN PIPES.

This invention relates to an adjustable pipe bend for drain pipes, particularly for waste pipes from floor drains, handwash bowls, kitchen sinks etc., comprising at least two pipe bend parts having abutting end portions extending in a plane which is inclined relative to the main axis of the respective pipe bend part, said pipe bend parts being rotatably connected to each other at said end portions for rotation about an axis perpendicular to said plane or planes only.

Besides rigid pipe bends which are commercially available with bending angles of e.g. 15°, 30° and 45°, and which possibly for instance in form of a spigot-and-socket pipe bend may be combined with a similar pipe bend and be rotated in relation thereto to form an arbitrary other bending angle, there are on the market adjustable pipe bends of the above identified type comprising two pipe bend parts which by rotation relative to each other may be adjusted to an arbitrary bending angle up to e.g. 90°.

In such a known adjustable pipe bend each of the pipe bend parts are bent along a curved middle axis so that each of the abutting end portions forms an angle of 45° with the main axis of the respective pipe bend part. The end portions, which are circular having a circular light opening, are rotatably secured to each other by means of rim-flanges sealed against each other in a hollow, annularly shaped securing element. This known pipe bend is mechanically complicated but presents particularly that disadvadvantage that when set to small bending angles it presents a tortuous path for or a "break" in the flow passage through the pipe bend which increases the resistance to flow through the pipe bend but particularly acts as a place for depositing contaminants from the waste materials in the drain pipe which causes clogging of the pipe bend.

It is the object of the invention to provide an ad-

justable pipe bend of the initially mentioned type which is simpler mechanically constructed than the known ones and therefore cheaper to produce, and which for all of the set bending angles but particularly for the small ones presents a minimal obstruction for the flow passage through the pipe bend and does not show noticeable tortuousness of or "breaks" in the flow passage.

According to the invention this object is obtained by an adjustable pipe bend of the type mentioned which is generally characterized in that said plane or each said planes form(s) an angle of 22,5° with a plane perpendicular to the main axis of the respective pipe bend part, that the main axis of adjacent pipe bend parts for all mutual rotational positions of said pipe bend parts either intersect each other or are substantially coincident, and that the end portions of adjacent pipe bend parts are rotatably interconnected by means of elements placed outside the light pipe opening, and each element being shaped as a body of rotation about said axis of rotation and forming a half-part of a snap-lock connection including an O-ring seal.

A first embodiment of the adjustable pipe bend according to the invention is characterized in that it comprises two pipe bend parts each of which having a further end portion adapted to be connected to an element of said drain pipe. In this embodiment the bending angle may be optionally set between 0° and 45°.

Another embodiment of the adjustable pipe bend according to the invention is characterized in that it comprises three pipe bend parts, namely two outer parts and an intermediate part symmetrical about a midplane perpendicular to its main axis, each of said outer parts having a further end portion adapted to be connected to an element of said drain pipe. This embodiment will allow for optionally setting of the bending angle between 0° and 90°.

The pipe bend parts of the adjustable pipe bend according to the invention are preferably injection-moulded

parts of a plastics material.

In the following the invention will be described more detailed with reference to the drawings in which:

Figs. 1 to 3 show a first embodiment of the adjustable pipe bend according to the invention, and

Figs. 4 and 5 another embodiment of the inventive pipe bend.

In Figs. 1 to 3 is shown a first embodiment of the invention comprising a first pipe bend part 10 shown from the coupling end thereof in Fig. 1, and in elevation and partly in axial section in Fig. 2, respectively, and a second pipe bend part 12 shown in elevation and partly in axial section in Fig. 3.

As shown in Fig. 2 the first pipe bend part 10 has an end portion generally designed as 14 which is inclined an angle α of 22,5° relative to a plane perpendicular to the main axis 18 of the first pipe bend part 10. Similarly the second pipe bend part 12 shown in Fig. 3 has an end portion generally designed as 16 and also inclined an angle of 22,5° relative to the main axis 20 of the second pipe bend part 12.

The end portions 14 and 16 of the first and second pipe bend parts, 10 and 12 respectively, are configured as bodies of rotation about an axis of rotation generally perpendicular to each of said end portions 14 and 16, respectively, said bodies of rotation having ribs and grooves together designed as 22 and 24, respectively, which are placed outside the light opening of the through bores 26 and 28, respectively of parts 10 and 12.

The ribs and grooves 22 of the pipe bend part 10 are formed as the male part and the ribs and grooves 24 of the pipe bend part 12 are formed as the female part of an inter-engageable snap-lock connection which when snapped together allows for roation of the pipe bend parts 10 and 12 relative to each other about said axis of rotation.

In connection with the male snap-lock part 22 on the

first pipe bend part 10 an O-ring seal 30 is provided in a corresponding groove in order to provide sealing against a generally cylindrical surface of the female snap-lock part 24 on the second pipe bend part 12.

The other end portions 32 and 34 of the pipe bend parts 10 and 12, respectively, are provided with per se known means such as sockets for securing them to pipe elements (not shown) in a drainage system.

The pipe bend parts 10 and 12 may by being turned relative to each other be set to any bending angle between 0° and 45°, and their axis 18 and 20, respectively, will either be substantially coincident or intersect each other.

Figs. 4 and 5 show another embodiment of the invention both in an exploded view and more particularly shows Fig. 4 the pipe bend in a straight position, i.e. having a bending angle of 0°, and Fig. 5 shows the pipe bend in a position where the bending angle is 90°.

In Figs. 4 and 5 parts identical or similar to those shown in Figs. 1 to 3 have been given the same reference numerals.

In this embodiment the pipe bend comprises three parts, namely a first pipe bend part 10, a second pipe bend part 12, and an intermediate pipe bend part 11.

The first and second pipe bend parts 10 and 12, respectively, are configured exactly as the pipe bend part 12 of the first embodiment shown in Fig. 3 having end portions 16 inclined an angle of 22,5° relative to a plane perpendicular to the main axis 18 and 20 of pipe bend parts 10 and 12, respectively. The end portions 16 having ribs and grooves 24 therein forming the female part of a snap-lock connection.

The intermediate pipe bend part 11 is symmetrical about a midplane perpendicular to its main axis 19, and its end portions 14 form an angle of 22,5° with said midplane. The end portions 14 having ribs and grooves 22 thereon forming a male part of the snap-lock connection. Further an

O-ring 30 is placed in a corresponding groove in each of the end portions 14.

The other end portions 32 and 34 of the pipe bend parts 10 and 12, respectively, are as in the first embodiment shown in Figs. 1 to 3 provided with per se known means such as sockets for securing them to a drain pipe element (not shown) in a drainage system. In this embodiment the three pipe bend parts 10, 11 and 12 may be turned relative to each other to set any bending angle between 0° and 90°, and the axis of adjacent pipe bend parts 10, 11 or 11, 12 will for any set bending angle of the pipe bend either intersect each other or be substantially coincident.

In both of the above described embodiments the tortuous flow path present in known pipe bends of a similar type is avoided for any set angle of the pipe bend while maintaining an unobstructed light opening for the passage of flow therethrough.

The pipe bend parts 10, 11 and 12 may be made of any suitable material and in any suitable way but it is preferred that the parts are made by injection moulding of a plastics material.

Modifications of the pipe bend according to the invention are possible within the scope of the appended claims. For example may in the embodiment shown in Figs. 4 and 5 the first and second pipe bend parts 10 and 12, respectively, be formed exactly as the first and second pipe bend parts 10 and 12 of the first embodiment shown in Figs. 1 to 3, i.e. with pipe bend part 10 having a male part 22 and pipe bend part 12 having a female part 24 of a snap-lock connection while the intermediate pipe bend part 11 has a female part 24 for engagement with the male part 22 of pipe bend part 10 and a male part 22 for engagement with the female part 24 of pipe bend part 12. In such a modification the first and second pipe bend parts 10 and 12 of the first embodiment shown in Figs. 1 to 3 may be supplemented with such an intermediate pipe bend part 11 to form an adjustable

pipe bend similar to the embodiment shown in Figs. 4 and 5. Also, while the end portions 32 and 34 of the pipe bend parts 10 and 12, respectively, as shown in the drawings are provided with connection means such as sockets, it will be understood that either of the end portions 32 or 34 may be formed as a spigot end portion or alternatively may be provided with an external thread as it is well known in the art.

CLAIMS.

1. An adjustable pipe bend for drain pipes, particularly for waste pipes from floor drains, handwash bowls, kitchen sinks, etc., comprising at least two pipe bend parts (10,11,12) having abutting end portions (14,16) extending in a plane which is inclined relative to the main axis (18,19,20) of the respective pipe bend part (10,11,12), said pipe bend parts (10,11,12) being rotatably connected to each other at said end portions (14,16) for rotation about an axis perpendicular to said plane or planes only **characterized in** that said plane or each said planes form(s) an angle of 22,5° with a plane perpendicular to the main axis (18,19,20) of the respective pipe bend part (10,11,12), that the main axis (18,19,20) of adjacent pipe bend parts (10,11,12) for all mutual rotational positions of said pipe bend parts (10,11,12) either intersect each other or are substantially coincident, and that the end portions (14,16) of adjacent pipe bend parts are rotatably interconnected by means of elements (22,24) placed outside the light pipe-opening, and each of said elements (22,24) being shaped as a body of rotation about said axis of rotation and forming half-part of a snap-lock connection including an O-ring seal (30).

2. An adjustable pipe bend according to claim 1 **characterized in** that it comprises two pipe bend parts (10,12) each of which having a further end portion (32,34) adapted to be connected to an element of said drain pipe.

3. An adjustable pipe bend according to claim 1 **characterized in** that it comprises three pipe bend parts (10,11,12), namely two outer parts (10,12) and an intermediate part (11) symmetrical about a midplane perpendicular to its main axis (19), each of said outer parts (10,12) having a further end portion (32,34) adapted to be connected to an element of said drain pipe.

4. An adjustable pipe bend according to any of the preceding claims **characterized in** that said pipe bend parts

(10,11,12) are injection-moulded parts of a plastics material.

5. An adjustable pipe bend substantially as shown in Figs. 1 to 3.

6. An adjustable pipe bend substantially as shown in Figs. 4 and 5.

AMENDED CLAIMS
[received by the International Bureau on 7 October 1992 (07.10.92); original claims 5 and 6 deleted; original claim 1 amended; remaining claims unchanged (2 pages)]

1. An adjustable pipe bend for drain pipes, particularly for waste pipes from floor drains, handwash bowls, kitchen sinks, etc., comprising at least two pipe bend parts (10,11,12) having abutting end portions (14,16) extending in a plane which is inclined relative to the main axis (18,19,20) of the respective pipe bend part (10,11,12), said pipe bend parts (10,11,12) being rotatably connected to each other at said end portions (14,16) for rotation about an axis perpendicular to said plane or planes only, and where said plane or each said planes form(s) an angle of 22,5° with a plane perpendicular to the main axis (18,19,20) of the respective pipe bend part (10,11,12), characterized in that the main axis (18,19,20) of adjacent pipe bend parts (10,11,12) for all mutual rotational positions of said pipe bend parts (10,11,12) either intersect each other or are substantially coincident, and that the end portions (14,16) of adjacent pipe bend parts are rotatably interconnected by means of elements (22,24) placed outside the light pipe-opening, and each of said elements (22,24) being shaped as a body of rotation about said axis of rotation and forming half-part of a snap-lock connection including an O-ring seal (30).

2. An adjustable pipe bend according to claim 1 characterized in that it comprises two pipe bend parts (10,12) each of which having a further end portion (32,34) adapted to be connected to an element of said drain pipe.

3. An adjustable pipe bend according to claim 1 characterized in that it comprises three pipe bend parts (10,11,12), namely two outer parts (10,12) and an intermediate part (11) symmetrical about a midplane perpendicular to its main axis (19), each of said outer parts (10,12) having a further end portion (32,34) adapted to be connected to an element of said drain pipe.

4. An adjustable pipe bend according to any of the preceding claims characterized in that said pipe bend parts

(10,11,12) are injection-moulded parts of a plastics material.

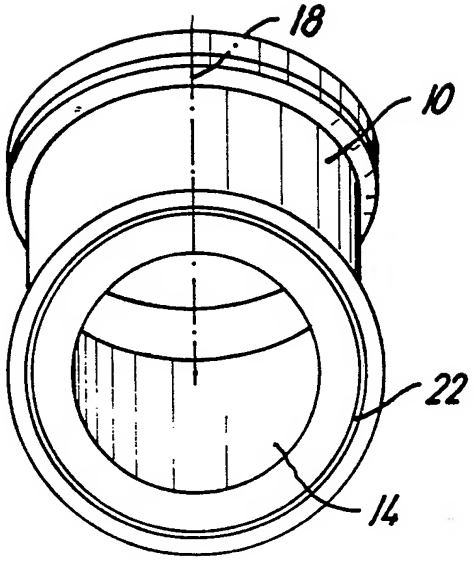
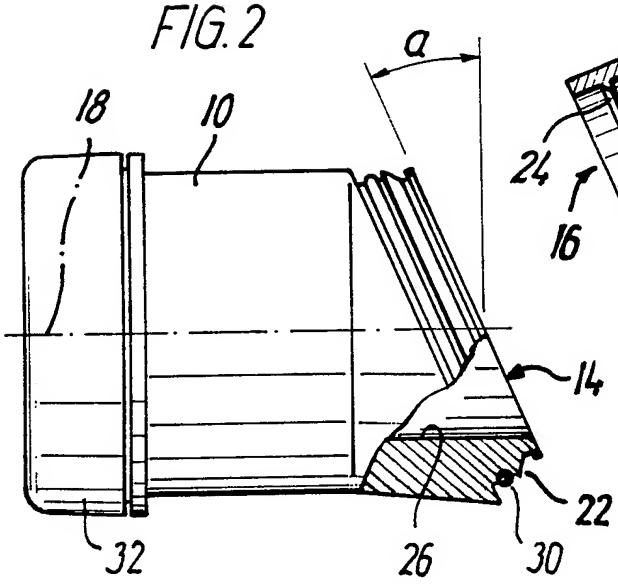


FIG. 1

FIG. 2



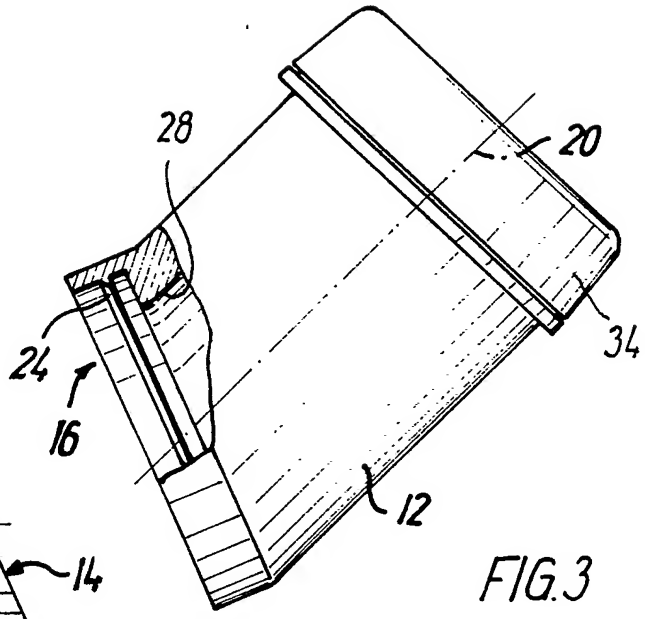


FIG. 3

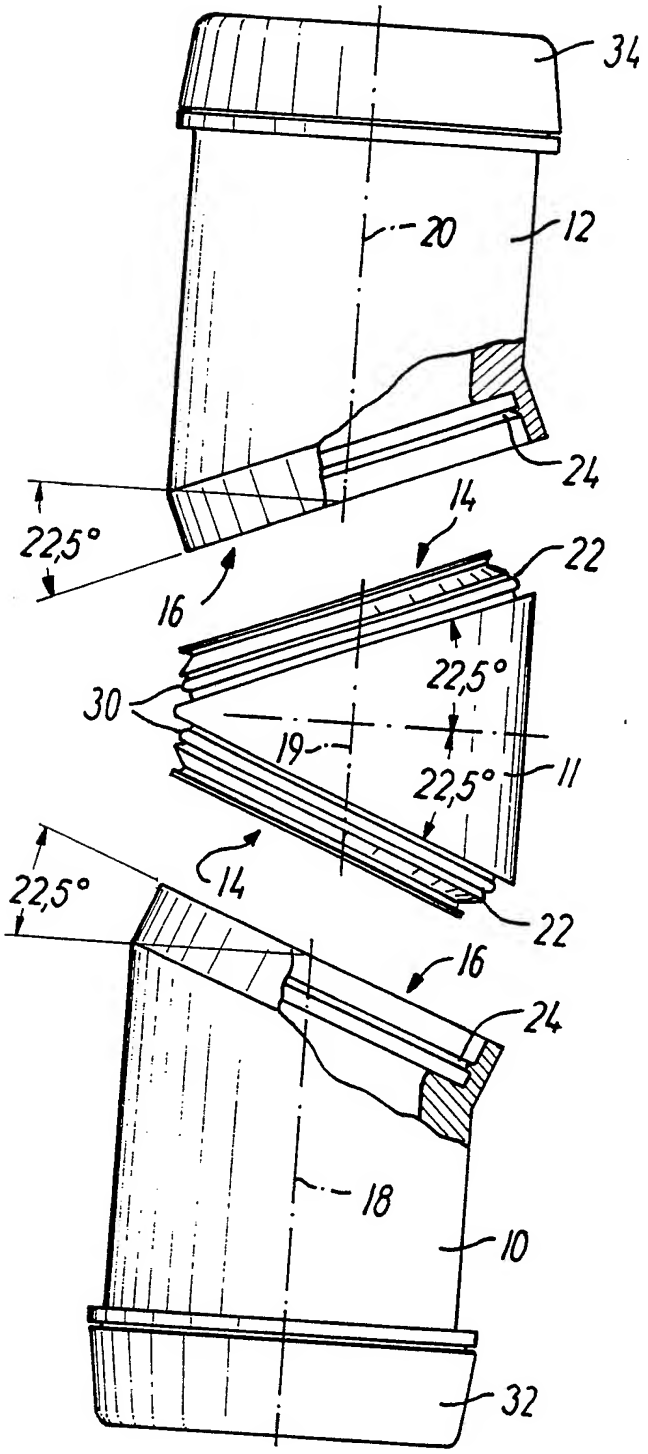


FIG. 4

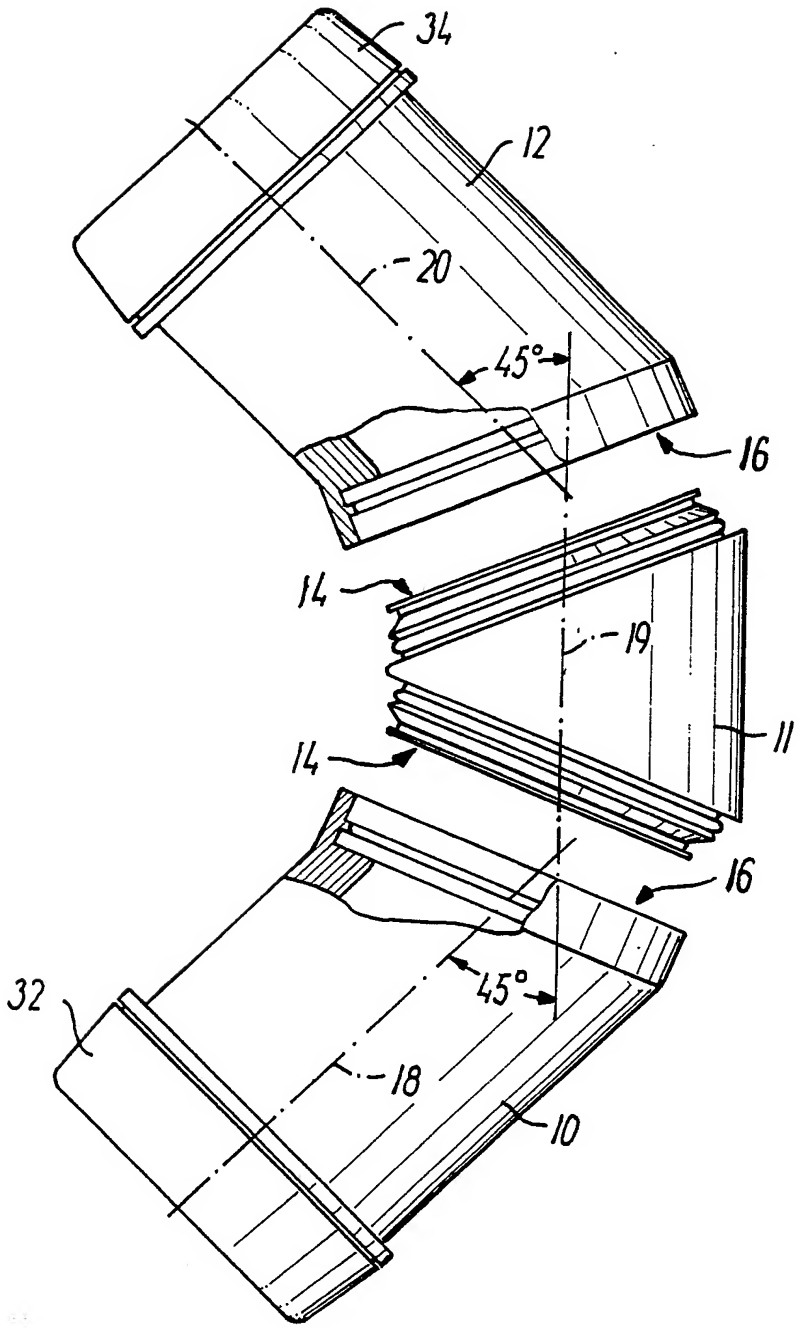


FIG.5

INTERNATIONAL SEARCH REPORT

International Application No PCT/DK 92/00147

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: F 16 L 27/00, 43/00

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	F 16 L

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched[8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
Y	DE, A1, 3825866 (CARL KURT WALTHER GMBH & CO KG) 1 February 1990, see column 1, line 32 - line 35; column 4, line 38 - line 42; figures 1-4 --	1
Y	US, A, 1836336 (DANIEL BENSON REPLOGLE) 15 December 1931, see page 1, line 22 - line 23; figures 1-11 --	1
A	DE, A1, 2750649 (FREITAG, BERND; ALTHAUS, GERHARD) 17 May 1979, see the whole document --	3
A	EP, A1, 0119782 (CAMP. DOUGLAS CHARLES PETER JOHN) 26 September 1984, see the whole document --	2,3

* **Special categories of cited documents:**[10]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
31st July 1992	1992 -08- 06
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	Axel Lindhult

Form PCT/ISA/210 (second sheet) (January 1985)

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	EP, A1, 0382971 (DU PONT (UK) LIMITED) 22 August 1990, see the whole document --	3

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [1]

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers....., because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claim numbers..5..6.., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

Claims 5 and 6 are obscure and do not define the invention (PCT Rule 6.2(a))

3. ☐ Claim numbers....., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [2]

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the the claims. It is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additonal fee.

Remark on Protest

☐ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional seach fees.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. PCT/DK 92/00147

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the Swedish Patent Office EDP file on 01/07/92
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-A1- 3825866	90-02-01	NONE		
US-A- 1836336	31-12-15	NONE		
DE-A1- 2750649	79-05-17	NONE		
EP-A1- 0119782	84-09-26	AU-B-	571491	88-04-21
		AU-D-	2532084	84-09-13
EP-A1- 0382971	90-08-22	NONE		

PUB-NO: WO0092199O1A1

DOCUMENT-IDENTIFIER: WO 9219901 A1

TITLE: AN ADJUSTABLE PIPE BEND FOR DRAIN PIPES

PUBN-DATE: November 12, 1992

INVENTOR-INFORMATION:

NAME	COUNTRY
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APPL-NO: DK09200147

APPL-DATE: May 7, 1992

PRIORITY-DATA: DK00085191A (May 7, 1991) , DK00160991A (September 17, 1991)

INT-CL (IPC): F16L027/00 , F16L043/00

EUR-CL (EPC): E03C001/122 , F16L027/08

US-CL-CURRENT: 285/184

ABSTRACT:

CHG DATE=19990617 STATUS=O>An adjustable pipe bend comprises two pipe bend parts (10, 12) having abutting end portions (14, 16) extending in a plane which is inclined, an angle alpha of 22.5 DEG relative to a plane perpendicular to the main axis (18, 20) of the respective pipe bend part (10, 12). The pipe bend parts (10, 12) are rotatably connected to each other at said end portions (14, 16) for rotation about an axis perpendicular to said inclined plane by means of snap-lock connecting elements (22, 24) placed outside the light borings (26, 28) of said pipe bend parts (10, 12). Each connecting element is shaped as a body of rotation about said axis of rotation, and the snap-lock connection includes an O-ring seal (30). The pipe bend may optionally be set to any bending angle between 0 DEG and 45 DEG by turning the two pipe bend parts (10, 12) relative to each other, and in any position of the two pipe bend parts (10, 12), their main axis (18, 20) will either intersect each other or be substantially coincident.